

1 We claim:

1 1. A method to write information to two virtual tape servers, wherein a first  
2 virtual tape server comprises one or more first virtual host devices having a first  
3 adjustable aggregate bandwidth, and wherein said first virtual tape server provides  
4 information to, and receives information from, a second virtual tape server, comprising  
5 the steps of:  
6 writing a host computer file to one of said one or more virtual host devices  
7 disposed in said first virtual tape server;  
8 queuing a copy job, wherein said copy job comprises copying said host computer  
9 file to said second virtual tape server;  
10 determining the age of said queued copy job;  
11 setting an age threshold;  
12 determining if the age of said queued copy job is greater than said age threshold;  
13 operative if the age of said queued copy job is greater than said age threshold,  
14 decreasing said first adjustable aggregate bandwidth.

1 2. The method of claim 1, further comprising the step of operative if the age  
2 of said queued copy job is not greater than said age threshold, restoring said first  
3 adjustable aggregate bandwidth to a pre-determined nominal value.

1 3. The method of claim 1, wherein said second virtual tape server comprises  
2 one or more second virtual host devices having a second adjustable aggregate bandwidth  
3 further comprising the step of operative if the age of said queued copy job is greater than  
4 said age threshold, decreasing said second adjustable aggregate bandwidth.

1           4.       The method of claim 3, further comprising the step of operative if the age  
2 of said queued copy job is not greater than said age threshold, restoring said second  
3 adjustable aggregate bandwidth to a pre-determined nominal value.

1           5.       The method of claim 1, further comprising the steps of:  
2           providing one or more host computers, wherein said first virtual tape server and  
3 said second virtual tape server are capable of communicating with said one or more host  
4 computers;

5           providing a virtual tape controller, wherein said virtual tape controller is  
6 interconnected with said one or more host computers, with said first virtual tape server,  
7 and with said second virtual tape server, and wherein said virtual copy controller  
8 comprises a copy queue;

9           queuing said copy job in said copy queue;

10          providing said host computer file from said first tape server to said second virtual  
11 tape server.

1           6.       The method of claim 5, further comprising the steps of:  
2           retrieving by said virtual copy controller said copy job from said copy queue;  
3           writing said host computer file to a virtual copy device disposed in said second  
4 virtual tape server.

1           7.       The method of claim 5, further comprising the steps of:  
2           setting a status signal time interval;  
3           providing a status signal from said virtual tape controller to said first virtual tape  
4 server and to said second virtual tape server at said status signal time interval.

1           8.       The method of claim 5, further comprising the steps of:  
2           queuing a plurality of copy jobs in said copy queue;  
3           determining the age for each of said queued copy jobs;  
4           providing a status signal comprising the age of the oldest queued copy job;  
5           determining if the age of the oldest queued copy job exceeds said age threshold;  
6           operative if the age of the oldest queued copy job is greater than said age  
7 threshold, decreasing said first adjustable aggregate bandwidth and said second  
8 adjustable aggregate bandwidth;  
9           operative if the age of the oldest queued copy job is not greater than said age  
10 threshold, restoring said first adjustable aggregate bandwidth and said second adjustable  
11 aggregate bandwidth to a pre-determined nominal value.

1           9.       An article of manufacture comprising one or more virtual host devices  
2 having an adjustable aggregate bandwidth and a computer useable medium having  
3 computer readable program code disposed therein to write information to two virtual tape  
4 servers, wherein said article of manufacture is capable of communicating with one or  
5 more host computers via a virtual tape controller, and with a second virtual tape server  
6 via said virtual tape controller, and wherein said article of manufacture provides  
7 information to, and receives information from, said second virtual tape server, the  
8 computer readable program code comprising a series of computer readable program steps  
9 to effect:  
10           receiving a host computer file via said one or more virtual host devices;

11 receiving a signal from said virtual tape controller, wherein said signal comprises  
12 the age of a copy job queued in said virtual tape controller, wherein said copy job  
13 comprises copying said host computer file to said second virtual tape server;  
14 retrieving a pre-determined age threshold;  
15 determining if said age of said queued copy job is greater than said age threshold;  
16 operative if said age of said queued copy job is greater than said age threshold,  
17 decreasing said adjustable aggregate bandwidth.

1 10. The article of manufacture of claim 9, said computer readable program  
2 code further comprising a series of computer readable program steps to effect restoring  
3 said adjustable aggregate bandwidth to a pre-determined nominal value if said age of said  
4 queued copy job is not greater than said age threshold.

1 11. The article of manufacture of claim 9, said computer readable program  
2 code further comprising a series of computer readable program steps to effect providing  
3 said host computer file to said second virtual tape server.

1 12. The article of manufacture of claim 11, said computer readable program  
2 code further comprising a series of computer readable program steps to effect receiving a  
3 signal from said virtual tape controller that said host computer file was written to said  
4 second virtual tape server.

1 13. The article of manufacture of claim 9, said computer readable program  
2 code further comprising a series of computer readable program steps to effect:

3 receiving a status signal from said virtual tape controller, wherein said status  
4 signal comprises a timestamp and the age of the oldest queued copy job at said  
5 timestamp.

1 14. A computer program product usable with a usable with a programmable  
2 computer processor having computer readable program code embodied therein to write  
3 information to two virtual tape servers, wherein a first virtual tape server is capable of  
4 communicating with one or more host computers via a virtual tape controller, and  
5 wherein said first virtual tape server comprises one or more virtual host devices having an  
6 adjustable aggregate bandwidth, and wherein said first virtual tape server provides  
7 information to, and receives information from, a second virtual tape server, comprising:  
8 computer readable program code which causes said programmable computer  
9 processor to receive a host computer file via said one of said one or more virtual host  
10 devices;  
11 computer readable program code which causes said programmable computer  
12 processor to receive a signal from said virtual tape controller, wherein said signal  
13 comprises the age of a copy job queued in said virtual tape controller, wherein said copy  
14 job comprises copying said host computer file to said second virtual tape server;  
15 computer readable program code which causes said programmable computer  
16 processor to retrieve a pre-determined age threshold;  
17 computer readable program code which causes said programmable computer  
18 processor to determine if the age of said queued copy job is greater than said age  
19 threshold;

20 computer readable program code which, if the age of said queued copy job is  
21 greater than said age threshold, causes said programmable computer processor to  
22 decrease said adjustable aggregate bandwidth.

1 15. The computer program product of claim 14, further comprising computer  
2 readable program code which, if the age of said queued copy job is not greater than said  
3 age threshold, causes said programmable computer processor to restore said adjustable  
4 aggregate bandwidth to a pre-determined nominal value.

1 16. The computer program product of claim 14, further comprising computer  
2 readable program code which causes said programmable computer processor to provide  
3 said file to said second virtual tape server.

1 17. The computer program product of claim 16, further comprising computer  
2 readable program code which causes said programmable computer processor to receive a  
3 signal from said virtual tape controller that said file was written to said second virtual  
4 tape server.

1 18. The computer program product of claim 14, further comprising:  
2 computer readable program code which causes said programmable computer  
3 processor to receive a status signal from said virtual tape controller, wherein said status  
4 signal comprises a timestamp and the age of the oldest queued copy job at said  
5 timestamp.

1 19. A data storage and retrieval system, comprising a first virtual tape server  
2 comprising one or more first virtual host devices having a first adjustable aggregate  
3 bandwidth, wherein said first virtual tape server is capable of communicating with one or

4 more host computers using said one or more first virtual host devices and with a second  
5 virtual tape server capable of communicating with said one or more host computers, and  
6 wherein said first virtual tape server provides information to, and receives information  
7 from said second virtual tape server via a virtual tape controller using the following steps:  
8 receiving a host computer file via said one or more virtual host devices;  
9 receiving a signal from said virtual tape controller, wherein said signal comprises  
10 the age of a copy job queued in said virtual tape controller, wherein said copy job  
11 comprises copying said host computer file to said second virtual tape server;  
12 retrieving a pre-determined age threshold;  
13 determining if the age of said queued copy job is greater than said age threshold;  
14 operative if the age of said queued copy job is greater than said age threshold,  
15 decreasing said first adjustable aggregate bandwidth; and  
16 operative if the age of said queued copy job is not greater than said age threshold,  
17 restoring said first adjustable aggregate bandwidth to a pre-determined nominal value.

1 20. The data storage and retrieval system of claim 19, wherein said virtual  
2 tape controller is interconnected with said one or more host computers and with said first  
3 virtual tape server and with said second virtual tape server, and wherein said virtual copy  
4 controller comprises a copy queue, wherein said virtual copy controller provides  
5 information to said second virtual tape server using the steps of:  
6 queuing said copy job in said copy queue; and  
7 providing said host computer file to said second virtual tape server.

1           21.     The data storage and retrieval system of claim 20, wherein said second  
2     virtual tape server comprises one or more second virtual host devices having a second  
3     adjustable aggregate bandwidth, wherein said second virtual tape server communicates  
4     with said one or more host computers using said one or more second virtual host devices,  
5     wherein said second virtual tape server receives information from said first virtual tape  
6     server using the steps of:  
7           operative if the age of said queued copy job is greater than said age threshold,  
8     decreasing said second adjustable aggregate bandwidth; and  
9           operative if the age of said queued copy job is not greater than said age threshold,  
10    restoring said second adjustable aggregate bandwidth to a pre-determined nominal value.